EFFECTIVE SCHOOL DISTRICTS IN MASSACHUSETTS

A Study of Student Performance on the 1999 MCAS Assessments

The Second Annual Report

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This research is designed to identify school districts in Massachusetts whose student test scores exceed the scores predicted by the district's demographic characteristics. The work is not intended to rank districts' performances but rather to highlight the efforts of districts whose students are exceeding what they would be expected to achieve on statewide standardized tests. The goal is to enable other districts to study and learn from the efforts of systems identified as effective in this analysis.

"Education, then, beyond all other devices of human origin,
is the great equalizer of the conditions of men..."
-- Horace Mann

The Effectiveness Index: Year II

The first analysis of school district effectiveness came out in February of 1999 and evaluated the 1998 MCAS in terms of district demography. The central tool of that analysis was the Effectiveness Index methodology that examines the relationship between selected demographic characteristics and educational outcomes. These characteristics include: average education level, average income, poverty rate, single-parent status, language spoken, and percentage of school-age population enrolled in private schools. These variables were chosen because they correlate with achievement and because the education literature identifies them as connected to academic performance.

Researchers ranging from James Coleman in the 1960s to James Comer in the 1990s have demonstrated that community demographics play a major role in how well children do in school. The Effectiveness Index provides a means of isolating the role played by community characteristics concerning student performance on statewide educational assessments. With a community's achievement context factored into its test results, it is possible to know how much value school systems add to demographic expectations.

The Effectiveness Index identifies school districts that add value to the learning readiness of their students as indicated by higher-than-predicted test scores. Identifying such systems is a first step to determining if they are indeed providing more effective educational services to their students. Identifying best practices in effective systems that are demographically similar to less effective systems may help those systems improve their school services.

This second edition incorporates several new elements into the process:

1) More districts are included. Last year's analysis was confined to communities of over 6,000 population. This year's evaluation considers any school district where at least 50 students took the MCAS exam in a grade. Last year's work covered about 93% of the students in the Commonwealth. This year's extends to about 97% of the student population taking MCAS.

2) Regional school districts are included in this year's work. Last year, only communities, not regional districts which are comprised of several communities, were considered. That meant that individual communities were evaluated outside of their regional school identity. For example, last year Pembroke was evaluated as Pembroke in 10th grade even though Pembroke is part of the Silver Lake Regional District for high school. This year's analysis looks at school district performance on a regional district basis where appropriate. Community demographics have been factored to reflect the regional school district characteristics.

Observations

• We see many repeat performers. Many districts that outperformed their demography last year did the same this year. These include Woburn, Harvard, North Reading, and Norwood. This is not surprising; a system that had organized itself to enhance student achievement in 1998 is likely to have kept that up in 1999.

• Some of the new over-performers made the list this year because they were not large enough to have been considered last year. Orleans, a strong over-performer this year, was too small to be included in last year's work. With smaller districts included this year, Orleans is in the mix.

• Districts that over-perform their demography tend to be middle-class or demographically advantaged communities. Generally, upper-demography communities are two to three times more likely to over-perform than communities that are of lower demography. This is unsettling in that middle and upper-middle class communities do not need to over-perform their demography to meet state achievement standards. Based on two years of MCAS, most of their students perform well enough now to pass the MCAS graduation requirements. Districts that are disadvantaged need to overcome their demography in order to lift more of their students into success on MCAS, but so far these districts are having a hard time outperforming their community characteristics.

• Districts that over-performed their demography did so without any apparent benefit from high per-pupil school spending or high levels of new state education reform aid. Generally, over-performers spent at or below state average and were not the recipients of generous amounts of Chapter 70 (education assistance and reform) aid. This fact is interesting in that providing additional funding is a major reform tool of the Education Reform Act of 1993. Based on this analysis, that extra funding has not necessarily purchased the systemic change that enables systems to help their students perform above their demographic expectations.

• So far after seven years of reform funding, there is little evidence that the schools have changed in any fundamental ways. MCAS scores were relatively flat from 1998 to 1999. This is of concern because *EducationWeek* pointed out that "Of the states in the early stages of testing, only Massachusetts failed to post significant gains in the second year of its new assessment." (David J. Hoff, *EducationWeek*, Jan 26, 2000; p. 12; "Testing's Ups And Downs Predictable.") With flat early results, the challenge of improving results, especially for demographically disadvantaged systems, is daunting.

The Importance of Identifying Over-performing Systems

Identifying systems that over-perform their demography is important in that such systems may have valuable lessons to offer similar systems in their efforts to boost student achievement. Most of the over-performers were not among the demographically disadvantaged systems. This means that when we identify low demography/over-performing systems, we need to study them carefully and see if they indeed do have lessons to teach their peers across the Commonwealth. After two years of MCAS, we know that many of our less advantaged districts have far to go to meet new state standards, so helping them move ahead is critically important to ultimate success.

The real battle in education reform is to change the way disadvantaged systems teach their children. Approximately 60% of students in very disadvantaged systems are not now in a position to meet state graduation standards. Those systems are home to 266,000 students, 31% of the state's student population. These are future citizens who are struggling to learn how to read, write, and do basic math at a level sufficient to meet state standards and to succeed in life. Identifying peer systems that have figured out how to help their students over-perform their demography is essential to making education reform work in Massachusetts.

The MCAS

Testing plays an important role in most of the contemporary school reform efforts in the United States. The Massachusetts education reform effort is no exception. Its testing vehicle is the Massachusetts Comprehensive Assessment System or, as it is commonly known, the MCAS.

The MCAS is a battery of tests that is given each year to students in Grades 4, 8, and 10 in each school district. The MCAS is aligned with a series of curriculum frameworks that are being developed by the state Department of Education. MCAS covers such academic subjects as math, science, and literacy skills, with more subjects to be added later. The test scores are broken down by individual student, school, and district. The scores for individual students are available to their parents, teachers, principals, and superintendents. The scores for entire schools and districts are available to the public.

The chief objective of the state's education reform initiative is to enable public school students to achieve a certain level of knowledge and skill. The Massachusetts Department of Education has established this level by setting out what students are expected to learn in each basic subject. School districts are supposed to see to it that their students learn what they are expected to learn. The purpose of the MCAS is to gauge periodically how students are doing as they try to achieve this level of knowledge and skill.

With the MCAS, the state has, for the first time in its history, an evaluation mechanism that measures how much progress students are making towards meeting established goals. At the same time, individual schools districts are urged to anticipate and complement the MCAS by developing their own parallel methods of assessing how their students are doing. Thus, the education reform effort uses assessment as a way to help all students move toward a high level of academic achievement.

Just as this overall effort views higher student achievement as its end, it views the improvement of the public schools as its chief means to achieve this end. What happens in school is by no means the only or even the leading influence on how pupils currently perform on standardized academic tests. However, what happens in school obviously is the only means that is currently within the control of the schools themselves. So it is the only means of reform that is at the disposal of the education improvement effort as it now exists.

Improving Our Schools

The more the test scores can be used to inform decisions about how to alter what happens in school, the better the chances to make the schools more effective in helping their students learn more. Properly used, the results can pinpoint which approaches to teaching and learning are working and which are not. The MCAS also includes an array of diagnostic tools that let teachers and administrators spot areas where students perform poorly, so that the staff can work with the students to mend the weaknesses.

Consequently, the essence of education reform in Massachusetts can be summed up in a few words: Better student performance, through more effective schools.

However, for the MCAS to fulfill its intended role in the current education reform effort, there at least two important conditions that have to be met.

FIRST, the tests, and other assessments, must be fair and accurate. They must measure what children have learned, rather than just their social or economic background. They must not be biased for, or against, any group of students.

SECOND, the tests must be used to make the public schools more effective. Thus, the scores should drive an ongoing analysis of what makes the school experience effective. They must provide teachers with a critical piece of information about the potential learning problems and possibilities of individual students. And the information must be used as a basis for helping all students to do better.

To meet the second condition, we must be able to use the MCAS scores as one tool to discern the effectiveness of our schools. We must be able to establish how effective they are today, and to track the rise or fall of their effectiveness in the future. Thus, finding ways to measure school effectiveness is essential to education reform.

Measuring Effectiveness

Student academic performance, including how students do on MCAS tests, is influenced by two broad sets of factors: school factors and non-school factors. The first entail what happens in school, and thus what is within the control of the school district itself. The second entails conditions outside the schools, such as the demographic profile of the students and the community. As we look at a given district's average score on an MCAS test, we have to be able to discern how much of the score is tied to school factors, and how much of the score is explained by non-school factors.

We cannot begin to zero in on just how effective the school district itself is unless we can distinguish between the respective influences of the two types of factors. Only then can we discern how effectively the district itself performs, and how much it contributes to its students' average performance on the MCAS.

The Effectiveness Index (EI) provides insight into this distinction, and consequently provides some measure of the school district's contribution to its student performance. Thus, it supplies a piece of crucial insight as to which schools are more effective.

For a given district, the Effectiveness Index gauges the impact that school factors have on the average MCAS score. The greater the positive impact of the school factors, the higher the district's Effectiveness Index will be.

The Effectiveness Index is calculated in the following manner: For a given district, the six demographic factors are used as the basis for projecting a likely average score on the MCAS. The demographically-likely score is then compared to the average score that the students in the district actually received. The Effectiveness Index is the number that represents the difference between the likely score and the actual score.

If the number is negative – if the actual score is lower than the likely score – then this suggests that what is happening in the schools in the district is not enabling its students to perform beyond the demographic expectations for them. If the number is a positive number – if the actual score is higher than the likely score – then this suggests that what is happening in the schools is helping the district's students to surpass the demographic expectations for them. (For a fuller account of the development of the Effectiveness Index, please see Appendix B.)

How well do the school design and the curriculum promote learning for all? Are teachers top-notch professionals who have both the skills and commitment to teach all students? Are professional development activities rigorously aligned with efforts to increase student achievement? Is there strong, solid leadership in the school? Are there high expectations for all? Are parents full partners in their children's education? Are there adequate resources to do the job? These are all questions about school factors.[1]

In the research reported in this paper, non-school factors consist largely of the overlapping demographic conditions of family life and community life. This study utilizes six such conditions in a given school district: its median level of educational attainment; its median income level; its percentage of households above the poverty line; its percentage of single-parent families; its percentage of non-English-speaking households; and its level of private school enrollment. Statistical analysis shows that these factors form much of the non-school influence on how the state's students do on such standardized tests as the MCAS.[2]

As we all know, students in advantaged districts tend to get higher standardized test scores than students in disadvantaged districts. Thus, if a district's students get a high average score on an MCAS or other standardized tests, the test score by itself does not tell us how much of the score is explained by school factors and how much is explained by non-school factors. A high score might be tied more to advantaged demography than to what actually happens in the district's schools. The score by itself is not a sound guide to how effective the school district is.

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[1]Per pupil expenditure [PPE] is a school factor, but our measures of it are not always reliable. There is no standard accounting procedure for establishing PPE. For example, some systems might include teacher retirement costs, capital costs, federal funds, and long-term disability obligations in their per-pupil spending figure. Others might not. Therefore, comparisons across districts are difficult to make.

[2]Other family and community conditions are crucial to student success, but are hard to observe and measure. One would have to monitor many families and communities closely over time to discern how family and community behavior affect school outcomes. How many books are read in the family? How much time is taken up by TV-watching? How do the community's adults treat children other than their own? Does the community mentor its young people? It is hard to get reliable answers to such questions. But we do know that the children of advantaged families and communities are more likely on average to have resources and support, and children of less advantaged situations are less likely to have such. Therefore, we use gross measures of such support as a proxy for answers to the more specific questions that are so hard to pursue.

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What the Effectiveness Index Tells Us: Statewide Results

This work applied the Effectiveness Index methodology to the 1999 MCAS scores of school districts in the state. A few districts were too small for results to be statistically reliable so they are not included. The districts considered for this report comprise 97% percent of the total student population of those taking the MCAS in 1999.

One of the consistent findings of this research is that demography explains most of the variation in test scores from district to district. Results from this year's research are similar to results from last year's work: about 84% of the variation in test results (scores for all of the test-taking students for the nine MCAS tests combined) is explained by demography. That is why Weston and Wayland have high MCAS scores and why Holyoke and Brockton have low MCAS scores. Thus, though demography is not destiny, it sets a strong tendency.

A simple way to depict the respective contributions that demography and the schools make to the average level of student performance on the MCAS is this:

DEMOGRAPHY + SCHOOL = AVERAGE SCORE

Despite the heavy weight of demography in today's learning equation, a number of districts achieved test scores that are significantly higher than their demography predicts.

Effective and Noteworthy School Districts

The Effectiveness Index lets us identify two types of school districts that are interesting in terms of education reform: Effective Districts and Noteworthy Districts.

An EFFECTIVE district meets two specifications:

1) Its Effectiveness Index is a positive number - that is, its actual score on the test is higher than its demographically likely score.

2) Its actual score is equal to or higher than the average MCAS score for the state as a whole.

Thus, a district that meets both of these specifications invites further and closer scrutiny to determine whether its practices provide a worthwhile model for other districts. Not all districts that meet the two effectiveness specifications will prove to have lessons to teach other systems.

Stoneham, Norwood, and Millbury are examples of effective school districts. Actual total MCAS scores in those districts are substantially higher than their demographically likely score. Stoneham's MCAS scores are 58 ranks higher than its demography; Norwood's scores are 42 ranks higher; and Millbury's scores are 34 ranks above its demographic position. Additionally, each of these districts' total 1999 MCAS score is higher than the statewide average score.[3]

A NOTEWORTHY district fits the first specification but doesn't fit the second. Since its performance helps its students to go beyond their demography, it is still worthy of note. What such a district is doing educationally can hold useful lessons for districts that are demographically similar, but do not outscore their demography. And such a district is more likely to deliver a return on future public investment than an ineffective district.

Here, Everett and Gardner are outstanding examples.

• For the second year in a row, Everett's overall score on all nine tests combined is much higher than its demography predicts. Further, Everett's 10th grade scores were substantially better than demography would suggest. This is interesting because urban high schools so far have proven to be very problematic in terms of implementing effective reform.

• Gardner's total MCAS scores on all three MCAS tests surpass its demographic prediction. What is especially encouraging is that Gardner middle and high school students greatly over-performed their demography, again an unusual circumstance for demographically challenged communities.[4]

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[3]In terms of demography of the 204 school systems whose students took all MCAS tests, Stoneham ranks #109, squarely in the middle. Its combined MCAS scores were the 51st highest in the state. Norwood ranks #89 demographically; its combined MCAS scores were the 47th highest in the state. Millbury ranks 123rd demographically and had the 89th highest MCAS scores.

[4]In terms of demography of the 204 school systems whose students took all MCAS tests, Everett ranks #186. Its combined MCAS scores were the 166nd highest in the state. Gardner ranks #181st demographically; its combined MCAS scores were the 151st highest in the state.

Making the Grade

MCAS and the Class of 2003 For the Class of 2003, success on the MCAS is currently defined as scoring Needs Improvement or better on both the Math and English Language Arts (ELA) tests. Although students take the Science and Technology MCAS tests, members of the Class of 2003 will not have to pass it to meet state requirements.

Let us imagine that the scores obtained on last year's 8th grade MCAS by students in the Class of 2003 counted for graduation. For students who attend school in the 25 most advantaged communities[5], 3% of the students would have failed the ELA test and 12% would have failed the Math. Since students must pass both to graduate, 12% of students in demographically advantaged communities would have failed.

For students who attend school in the 25 most disadvantaged communities[6], 27% of the students would have failed the ELA test and 65% would have failed the Math. Since students must pass both to graduate, 65% of students in demographically disadvantaged communities would have failed. Children in the schools in the 25 most demographically challenged communities account for 31% of all of the public school students in Massachusetts.

The chart on the following page illustrates the range of achievement between advantaged and disadvantaged communities in Massachusetts. This presentation looks at the state in terms of demographic kind of community (KOC) with cities and towns being placed in one of six KOC clusters. The methodology for measuring demography was developed in a dissertation. (See Appendix B.)

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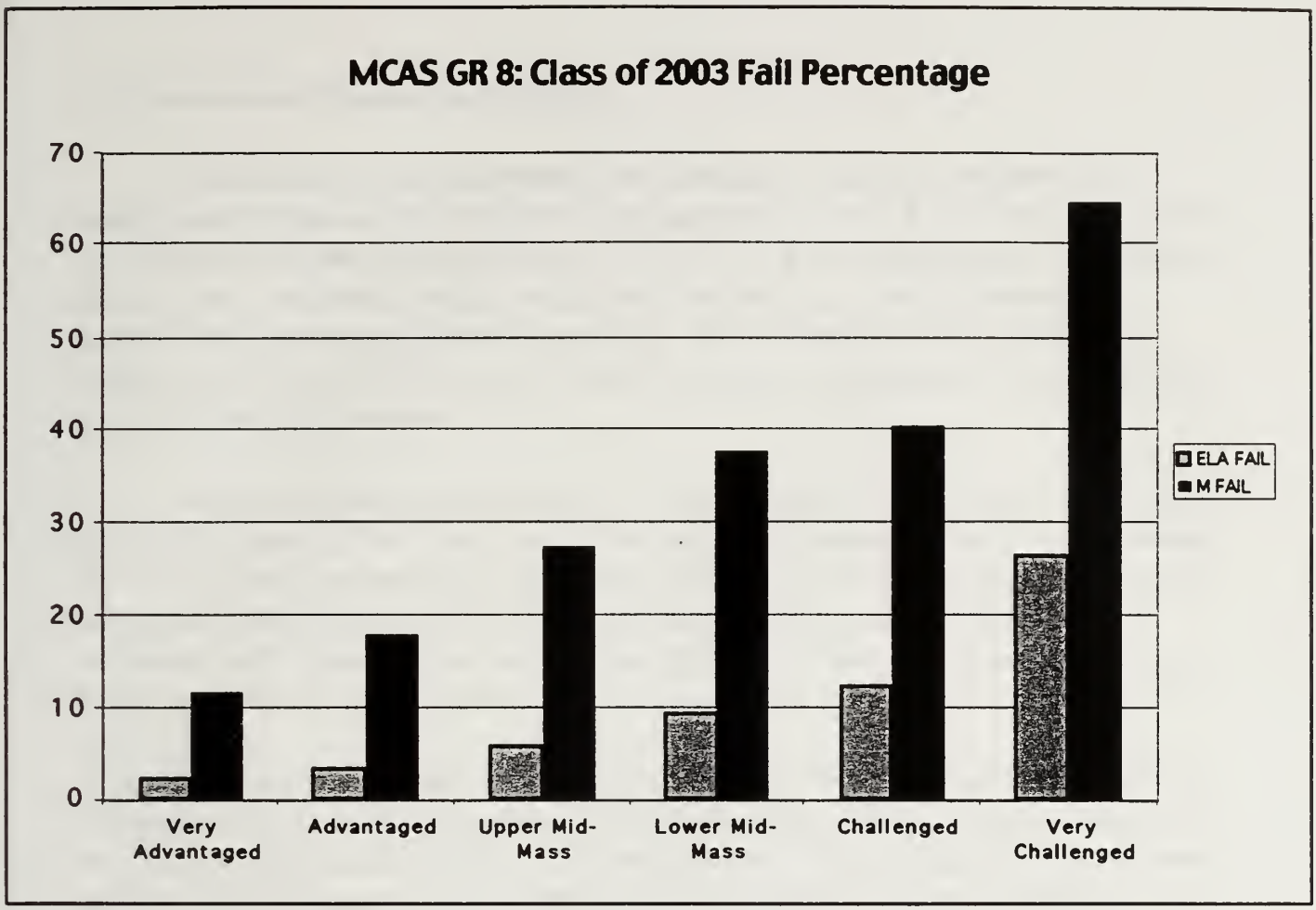
[5]The 25 most advantaged 8th grade districts demographically, in order from most advantaged down, are: Weston, Carlisle, Dover-Sherborn, Sudbury, Wellesley, Wayland, Cohasset, Concord, Acton-Boxborough, Medfield, Winchester, Duxbury, Lincoln. Lexington, Southborough, Longmeadow, Norwell, Andover, Holliston, Westwood, Westford, Bedford, Needham, Hingham, and Hopkinton.

[6]The 25 most disadvantaged 8th grade districts demographically, in order from most disadvantaged up, are: Lawrence, Chelsea, Holyoke, New Bedford, Lowell, Springfield, Fall River, Boston, Lynn, Fitchburg, Southbridge, Worcester, Revere, Brockton, Somerville, Chicopee, Taunton, Everett, Ludlow, Ware, North Adams, Webster, Gardner, Leominster, and Malden.



Not surprisingly, a district's success in placing its students in the pass category is very dependent upon its demography. The dimension of the challenge facing education reformers is clear as we end the first phase of the school improvement effort: Find ways to boost achievement of students in our less advantaged communities.

Note:

Very Advantaged communities include towns such as Wellesley, Lexington, Medfield, and Andover.

Advantaged communities include Franklin, Marblehead, Natick, and Newton.

Upper Mid-Mass communities include Walpole, Ipswich, Brookline, and Chatham.

Lower Mid-Mass communities include Beverly, East Bridgewater, Stoneham, and Agawam.

Challenged communities include Dartmouth, Quincy, Peabody, and Methuen.

Very Challenged communities include Everett, Ware, Fall River, and Boston.

The Importance of Reading and Writing

While students need to develop a broad range of skills and competencies, reading and writing are the foundations for academic success. E. D. Hirsch, Jr., author of *The Schools We Need* and the developer of the Core Knowledge Curriculum, observes that "... good competency tests in reading turn out to be powerfully indicative of achieved abilities that go far beyond reading." (E. D. Hirsch, *Education Week*, Feb 2, 2000; p, 40, in "The Tests We Need.") Veteran educators understand that reading is the linchpin of academic success.

Having solid reading and writing skills are necessary conditions for doing well on the MCAS tests. This is true even of the tests in Mathematics. Many of the problems on the Math tests, particularly in grade eight and ten, are word problems. You cannot understand these problems if you cannot understand the words. In all subjects, moreover, many questions call for a written answer, as short as a sentence or two or as long as an essay of several paragraphs.

The tables in Appendix A list effective districts in terms of student performance in various subjects including reading. Several interesting systems that are effective in teaching reading (ELA) in Grade 4 are Orange, Monson, and Stoughton. Each of these districts had MCAS scores substantially above their predicted value. In Grade 8, Braintree, Quabbin Regional, and Northampton solidly over-scored their demography in ELA.

This study highlights these districts because they might have lessons to offer to other districts to help them to enhance their contribution to their student's future performance of the MCAS. It is especially important to note and study the success of demographically challenged and demographically average communities in exceeding expectations. In particular, Orange, a very challenged system, deserves consideration for adding value to the reading skills of its students.

Middle Massachusetts

In the demographic ranking of Massachusetts school districts, about 140 districts are concentrated in the demographic middle of the state.[7] These districts, with over two-and-a-half million people, make up what might be called Middle Massachusetts (MidMass). These systems may be well suited to play a crucial role in the short-term future of education reform.

For the state as a whole, as we have seen, demographic differences among the districts explain 84% of the variation in the districts' average overall test scores. All or much of the other 16% of the variation is probably explained by the differences in how the school districts themselves behave.

When looking at either end of the demographic ladder, we notice that scores tend to be very high or very low. While there is some variation, the solid suburbs score well. Conversely, the cities have low scores, again with some variation. In short, the overwhelming majority of students in advantaged districts pass MCAS easily; most students in disadvantaged districts are very far away from passing.

The pattern in Middle Massachusetts is different. Its districts exhibit a wide range of test scores -- although their demography is relatively similar.

This variation can be seen in the bar graph on the next page that shows total MCAS scores for the 1999 MCAS Grade 8 tests. (This utilizes the Grade 8 tests because these students are members of the first class that will have to pass MCAS in order to qualify for a high school diploma. Results for other grade levels are similar.)

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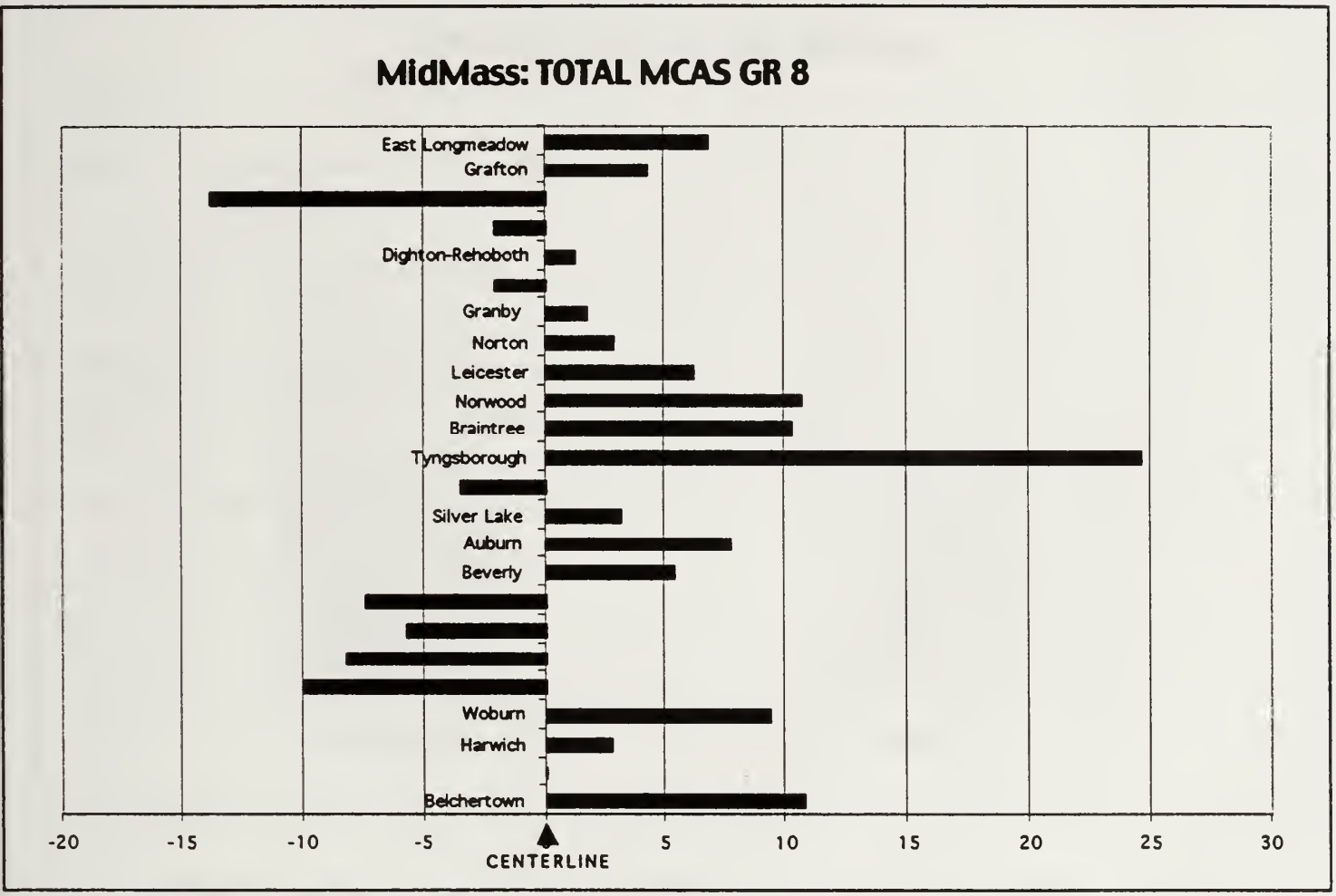
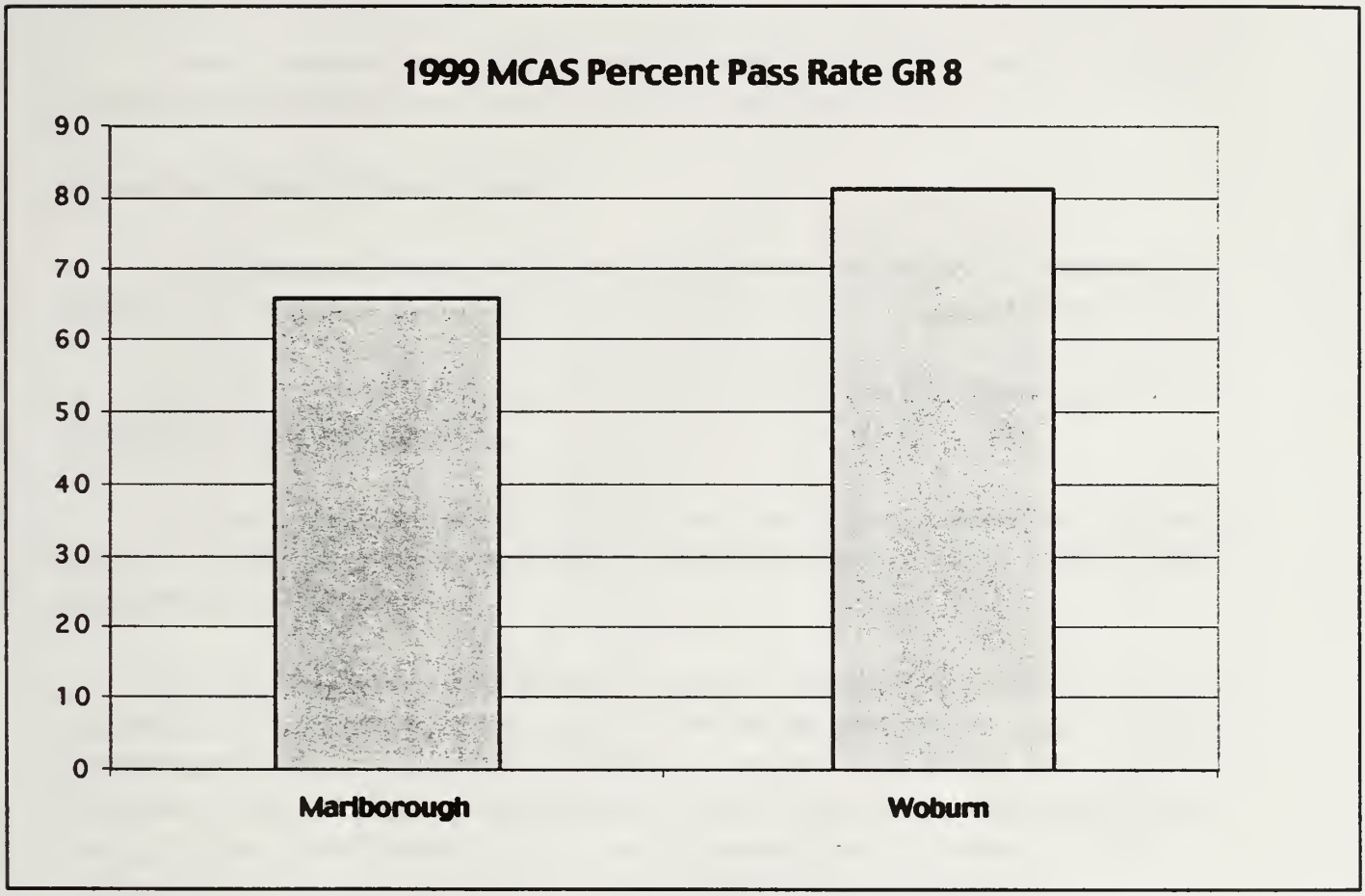
[7]Because of regional systems, the actual number of Massachusetts school districts varies with grade level. There are 243 Grade 4 districts, 231 Grade 8 districts, and 223 Grade 10 districts.

For each of the 25 districts in the demographic middle of the state – the districts that form the middle of Middle Massachusetts itself – the tip of the bar represents its actual test score on the 1999 Grade 8 MCAS. The centerline represents the score each community would be expected to achieve based on its demographics. The numbers on the bottom of the chart represent MCAS scaled score numbers. *Please Note: The communities are listed to the left of their MCAS performance; only over-performers are identified.*



As you can see, there is wide variation in actual test scores in towns that are very similar demographically. Since the demographic variation is slight, but the variation in test scores is great, this pattern suggests that much of the variation is explained less by demography than by differences in what the schools of MidMass are doing.

This variation has practical implications. Woburn is a district that over-performs its demography. Marlboro is a demographically similar system that is literally right next to Woburn in the demographic methodology. For Marlborough, 66% of the students passed the Grade 8 Math MCAS; for Woburn the pass rate was 82%. (Passing is defined as Needs Improvement or better in Math *and* ELA.) It is also interesting to note that Woburn's per-pupil expenditure was $5991; Marlborough's was $6534.



Further, the test scores of MidMass districts with high positive numbers on the Effectiveness Index are just as high as the scores of many of the advantaged districts. For example, for Grade 4, a class that started school as the Education Reform Act of 1993 was enacted, the total MCAS Grade 4 scores of Norwood, a MidMass district, are equal to the scores of Westwood, a very advantaged community. Similarly, fourth graders in Pembroke, another MidMass district, scored the same as students in Hamilton-Wenham, an advantaged district. It is important to note that both Westwood and Hamilton-Wenham students performed very well on the MCAS; the story here is how well youngsters in Norwood and Pembroke did.

So, if more MidMass districts become as effective as Norwood, Pembroke, and Woburn, then more MidMass districts will get test scores as high as the test scores of the advantaged districts.

Moreover, insofar as MidMass districts are demographically similar, what makes for effective schools in an effective districts in MidMass is more likely to make for effective schools in an ineffective district in MidMass.

Thus, in the short run, MidMass can be an especially fruitful place to seek, and expect to find, a relatively swift rise in MCAS test scores.

Education Reform in Massachusetts

The Education Reform Act of 1993 provides an opportunity to transform our schools. The Act can be understood in terms of two basic changes it brought about:

1) Sharply increasing the amount of state aid targeted at disadvantaged, low-spending communities; and

2) The establishment of statewide academic performance standards (curriculum frameworks) and an assessment device to measure progress towards meeting those standards (the MCAS).

The MCAS can be the backbone of our effort to make the schools work for all students, regardless of where they happened to be born and raised. It can assess the performance of districts, schools, and individual students, and it can inform the public about its schools. More importantly, MCAS's built-in diagnostics can help teachers to help all children learn better. Under the act, increased state funds have provided substantial amounts of new money for many districts to use for reform.

End Note

This study captures the role that demography plays in student performance on the 1999 MCAS. While demography is not destiny, it does establish a tendency. If we overlook the tendency of disadvantaged districts to produce low scores and under-educated students, then we will continue to consign the children of those districts to a future of unfulfilled potential. After seven years of education reform in Massachusetts, demography still plays too large a role in the school performance of our children.

Without a broad long-term effort to do what is needed to enhance performance by all, especially students in our disadvantaged systems, we can expect more of the same: A polarization of academic performance that troubles even those whose children are fortunate enough to have been born into a situation that makes a powerful contribution to their academic success.

After several years of education reform, not everything is clear. What is indisputable, however, is that we know that children in advantaged school districts are equipped to succeed in meeting state MCAS graduation requirements. We also know that children from disadvantaged districts, after billions of dollars in new spending, are still woefully under-prepared for success. "All children can learn" certainly sounds nice; the evidence is clear that we are far away from developing the kinds of effective schools where all children in fact do learn.

Massachusetts stands at a critical crossroads. The elements are in place for exciting statewide reform, but the barriers to change are substantial. The Education Reform Act of 1993 is being considered for reauthorization in the spring of 2000. While much has been accomplished, much remains to be done.

APPENDICES

Appendix A: Listings of Effective School Districts

Appendix B: Deriving the Effectiveness Index

APPENDIX A:
Effectiveness Indexes on the 1999 MCAS

The following charts list the top sixty districts in terms of their score on the Effectiveness Index. The Effectiveness Index is the difference between the likely score based on a district's demography and the district's actual score on the MCAS. Districts are listed from higher to lower Effectiveness Indexes.

When analyzing anything about student performance, it is important to understand that many Massachusetts communities are part of regional school districts and that, depending on grade level, a community's school district may change. Thus, the Grade 4 results reflect evaluating a different set of school districts than do the Grade 8 results and do the Grade 10 results. The following charts represent 97% of the state's students. Due to small sample size, those districts where fewer than 50 students took the MCAS are not included.

There are 351 communities in Massachusetts. There are 204 school districts whose children took MCAS tests in all three grades. The other communities are part of various regional school districts. Thus, the only way to compare *total* MCAS score is to limit that analysis to the 204 systems whose children in fact took MCAS tests at all three grade levels, Grades 4, 8, and 10.

Listings are provided for the following categories:

1) School Districts (including Regional Districts) for each grade level;

Grade four performance: all three subjects combined (English Language Arts, Math, Science)
Grade four performance: English Language Arts
Grade four performance: Math
Grade four performance: Science

Grade eight performance: All three subjects combined (English Language Arts, Math, Science. (NOTE: The History test results are not included in this analysis.)
Grade eight performance: English Language Arts
Grade eight performance: Math
Grade eight performance: Science

Grade ten performance: All three subjects combined (English Language Arts, Math, Science)
Grade ten performance: English Language Arts
Grade ten performance: Math
Grade ten performance: Science

2) School Districts whose students took all MCAS exams in all three grades in-district

This is also a listing of the 60 most Effective Districts of the 204 systems whose students participated in all three grades of MCAS in-district. This listing is derived from the same basic methodology as are the lists for Effective Districts in individual grades and subjects. It is based on looking at the difference between a district's demographic rank and its MCAS score rank. For example, if a district was ranked the 100th highest demographically and its students achieved a combined MCAS score that was the 80th highest in the state, that district would be a +20 in terms of overall effectiveness. If that district that was ranked #100 demographically and achieved a combined score that was the 120th highest, it would be a -20 in terms of overall effectiveness.

The following School District Effectiveness Listings are for each grade level and subject and for total MCAS score. The districts with the highest Effectiveness Indexes (over-performance of their demography) are to the upper left of the page; the districts to the lower right have lower Effectiveness Indexes but still over-performed.

Total 4 MCAS 1999 - EFFECTIVE DISTRICTS

Orleans
Woburn
Harvard
Orange
Pembroke
Marion
Norwood
Granby
Eastham
North Reading
Plymouth
Sharon
Newton
Arlington
East Longmeadow
Lexington
Topsfield
Everett
Shrewsbury
Monson
Sandwich
Chelsea
Braintree
Ayer
Acton
Wachusett Reg.
Stoughton
Beverly
Boylston
West Bridgewater

MOST EFFECTIVE

Scituate
Franklin
Lenox
Nashoba
Pentucket Regional
North Attleborough
Auburn
Belmont
Westford
Ludlow
Brewster
Dartmouth
Clinton
Wrentham
Dracut
Hudson
West Boylston
Winchester
Westborough
Boxborough
Danvers
Falmouth
Brookline
Littleton
Harwich
Sturbridge
Hampden Wilbraham
Gateway
Canton
Quabbin

EFFECTIVE

Arrow direction Indicates more effective
Noteworthy Districts in italics

ELA 4 MCAS 1999 - EFFECTIVE DISTRICTS

Pembroke
Woburn
Orleans
Eastham
Orange
East Longmeadow
Lenox
Everett
Harvard
North Reading
Acton
Monson
Stoughton
Sharon
Longmeadow
Arlington
Newton
Lawrence
Scituate
Braintree
West Boylston
Wrentham
Marion
Danvers
Norwood
Lexington
Topsfield
Sandwich
Pentucket Regional
Franklin

MOST EFFECTIVE

Boylston
Wachusett Reg.
Walpole
Beverly
Mansfield
Westborough
Plymouth
Uxbridge
Auburn
Wellesley
Weymouth
Berkshire Hills
Falmouth
Kingston
Dartmouth
Canton
Nashoba
Marshfield
Southborough
North Attleborough
Ayer
Brookline
Lee
Hudson
Wilmington
Acushnet
Shrewsbury
Medfield
Easton
Harwich

EFFECTIVE

Arrow direction Indicates more effective
Noteworthy Districts in italics

Math 4 MCAS 1999 - EFFECTIVE DISTRICTS

Orleans
Orange
Granby
Harvard
Woburn
Marion
Newton
Shrewsbury
Plymouth
Chelsea
North Reading
Lexington
Pembroke
Clinton
Wachusett Reg.
Winchester
Ayer
Norwood
Belmont
Beverly
Sandwich
Sturbridge
Sharon
Arlington
Dracut
Everett
Reading
Nashoba
Groton Dunstable
Triton

MOST EFFECTIVE

Franklin
Monson
Braintree
Topsfield
West Bridgewater
Harwich
East Longmeadow
Ludlow
Sutton
Webster
Dartmouth
Westford
Carlisle
Westborough
Littleton
Boxborough
Auburn
Wrentham
Acton
Falmouth
Scituate
Hingham
Leominster
Canton
Methuen
Chelmsford
Gateway
Brewster
Foxborough
Danvers

EFFECTIVE

Arrow direction Indicates more effective
Noteworthy Districts in italics

Science 4 MCAS 1999 - EFFECTIVE DISTRICTS

Orleans
Eastham
Harvard
Norwood
Woburn
Marion
Granby
Pembroke
Sharon
Plymouth
Topsfield
Orange
Arlington
Quabbin
North Reading
North Attleborough
East Longmeadow
Boylston
Hampden Wilbraham
Newton
Brookline
Wilmington
Chelsea
Hudson
Braintree
West Bridgewater
Everett
Monson
Brewster
Acton

MOST EFFECTIVE

Lexington
Dedham
Stoughton
Carver
Shrewsbury
Pentucket Regional
Westford
Ayer
Sandwich
Ludlow
Somerset
Scituate
Fall River
Auburn
Longmeadow
Mohawk Trail
Needham
Peabody
Williamstown
Ashubrnham Westminster
Gateway
Lenox
Lee
Oxford
Boxborough
Nashoba
West Boylston
Dartmouth
Swampscott
Franklin

EFFECTIVE

Arrow direction Indicates more effective
Noteworthy Districts in italics

Total 8 MCAS 1999 - EFFECTIVE DISTRICTS

Harvard
Stoneham
Tyngsborough
Westborough
North Reading
Hadley
Lenox
Sandwich
Amherst Pelham
Quabbin
Newburyport
Southern Berkshire
Clinton
Bedford
Medway
Berlin Boylston
Pentucket Regional
Northampton
Lawrence
Gardner
Berkshire Hills
Wayland
West Bridgewater
Chelsea
Belchertown
Norwood
Swampscott
Braintree
Woburn
Peabody

MOST EFFECTIVE

Triton
Wachusett Reg.
West Tisbury
Brookline
Manchester
Masconomet
Foxborough
King Philip
Stoughton
Tantasqua
Auburn
Abington
Ludlow
Easthampton
Dartmouth
Arlington
North Brookfield
Lexington
East Longmeadow
Newton
Medfield
Uxbridge
Carver
Leicester
Holbrook
Frontier
Ware
Sutton
Westford
Agawam

EFFECTIVE

Arrow direction Indicates more effective
Noteworthy Districts in italics

ELA 8 MCAS 1999 - EFFECTIVE DISTRICTS

Tyngsborough
Stoneham
Braintree
Quabbin
East Longmeadow
Woburn
Harvard
Sandwich
Pentucket Regional
Bedford
Lenox
Northampton
Lawrence
North Reading
Gardner
Clinton
Swampscott
Southern Berkshire
Westborough
Berkshire Hills
Berkley
Uxbridge
Brookline
Norton
Hadley
Arlington
Norwood
Manchester
Frontier
Medfield

MOST EFFECTIVE

Wakefield
Dartmouth
Amherst Pelham
Abington
Medway
Longmeadow
Berlin Boylston
Central Berkshire
Ralph Mahar
Chelsea
Westwood
Danvers
Lunenburg
North Adams
Masconomet
Gill Montague
Belchertown
Needham
Southbridge
Edgartown
Winthrop
Quincy
Foxborough
Wachusett Reg.
Stoughton
Reading
Newburyport
Northborough
Triton
Holbrook

EFFECTIVE

Arrow direction Indicates more effective
Noteworthy Districts in italics

Math 8 MCAS 1999 - EFFECTIVE DISTRICTS

Harvard
Newburyport
Tyngsborough
Stoneham
Amherst Pelham
West Bridgewater
Westborough
Lenox
Ware
Clinton
Sandwich
Chelsea
North Reading
Hadley
Quabbin
Southern Berkshire
Sutton
Medway
Berlin Boylston
Lawrence
Triton
Newton
Wachusett Reg.
Wayland
Ludlow
Gardner
Easthampton
Abington
Berkshire Hills
Grafton

MOST EFFECTIVE

Chatham
Foxborough
Stoughton
Belchertown
Acushnet
Tantasqua
Norwood
Shirley
Westford
Acton Boxborough
Hampshire
King Philip
Beverly
Lexington
Bedford
West Tisbury
Carver
Greenfield
Mendon Upton
Northampton
Northborough
Granby
Ipswich
Pentucket Regional
Nantucket
Frontier
Methuen
West Springfield
Walpole
Peabody

EFFECTIVE

Arrow direction Indicates more effective
Noteworthy Districts in italics

Science 8 MCAS 1999 - EFFECTIVE DISTRICTS

Stoneham
Westborough
Tyngsborough
Harvard
North Reading
Hadley
Monson
Masconomet
Amherst Pelham
Berlin Boylston
Bedford
Pentucket Regional
Northampton
Manchester
Sandwich
Lenox
Medway
Swampscott
Wayland
Peabody
Southern Berkshire
Newburyport
Quabbin
Auburn
West Tisbury
Easthampton
Berkshire Hills
Belchertown
Gardner
Lawrence

MOST EFFECTIVE

West Bridgewater
Norwood
Clinton
Holbrook
King Philip
Brookline
Tantasqua
North Brookfield
Leicester
Dartmouth
Lexington
Ayer
Longmeadow
Woburn
Triton
Agawam
Wachusett Reg.
Nantucket
Hingham
Concord
Chelsea
Berkley
Belmont
Medfield
East Longmeadow
Braintree
North Andover
Arlington
Foxborough
Hampden Wilbraham

EFFECTIVE

Arrow direction Indicates more effective
Noteworthy Districts in italics

Total 10 MCAS 1999 - EFFECTIVE DISTRICTS

Arrow direction Indicates more effective
Noteworthy Districts in italics

ELA 10 MCAS 1999 - EFFECTIVE DISTRICTS

Lenox
Shrewsbury
Chelsea
Littleton
Stoneham
Cohasset
Norton
Millbury
Belmont
Nauset
Carver
Westwood
Braintree
Pentucket Regional
Manchester
Harvard
Ayer
Fitchburg
North Adams
Rockland
Sandwich
Clinton
Amherst Pelham
Sharon
Berlin Boylston
Ashubrnham Westminster
Ashland
Berkshire Hills
Hanover
Brookline

MOST EFFECTIVE

Southbridge
Hopedale
Hadley
Westborough
Dracut
Swampscott
Auburn
Newburyport
Wachusett Reg.
Dennis Yarmouth
Pioneer Valley Reg.
Wareham
Needham
Bourne
West Boylston
Oxford
Ware
Dedham
Lawrence
Hudson
Everett
Medway
Old Rochester
Easton
Central Berkshire
Haverhill
Revere
Arlington
Falmouth
Hampshire

EFFECTIVE

Arrow direction Indicates more effective
Noteworthy Districts in italics

Math 10 MCAS 1999 - EFFECTIVE DISTRICTS

Harvard
Lenox
Hadley
Wachusett Reg.
Nauset
Lee
Shrewsbury
Georgetown
Pentucket Regional
Ayer
Swampscott
Belmont
Southbridge
Gardner
Andover
Berkshire Hills
Ware
Hampshire
Sharon
Westborough
Millbury
Carver
Cohasset
Westwood
North Adams
Monson
Old Rochester
Lowell
Belchertown
Norton

MOST EFFECTIVE

EFFECTIVE

Brookline
Acton Boxborough
New Bedford
Manchester
Ashubrnham Westminster
Everett
Masconomet
Holliston
Reading
Sandwich
Dennis Yarmouth
Littleton
Amherst Pelham
Ipswich
Arlington
Hudson
Ashland
Marlborough
West Boylston
Fitchburg
Medway
Grafton
Mohawk Trail
Northampton
Needham
Northboro Southboro
Auburn
Ludlow
Bedford
Hanover

Arrow direction Indicates more effective
Noteworthy Districts in italics

Science 10 MCAS 1999 - EFFECTIVE DISTRICTS

Millbury
Westborough
Lenox
Harvard
Shrewsbury
Medfield
North Adams
Hadley
Nauset
Lee
Webster
Belmont
Belchertown
Brookline
Norton
Manchester
Swampscott
West Boylston
Wachusett Reg.
Pentucket Regional
Berkshire Hills
Ashubrnham Westminster
King Philip
Andover
Clinton
Fitchburg
Chelsea
Northbridge
Westwood
Quaboag Regional

MOST EFFECTIVE

EFFECTIVE

Braintree
Sandwich
Medway
Everett
Berlin Boylston
Southbridge
Dracut
Cohasset
Ralph Mahar
Ashland
Lexington
Sharon
Littleton
Watertown
Holbrook
Dighton Rehoboth
Lowell
Carver
Swansea
Grafton
Reading
Monson
Palmer
North Attleborough
Concord Carlisle
Douglas
Needham
Arlington
Amherst Pelham
Bellingham

Arrow direction Indicates more effective
Noteworthy Districts in italics

Total MCAS 1999 - EFFECTIVE DISTRICTS
All 3 Grades, 3 subjects

Arrow direction Indicates more effective
Noteworthy Districts in italics

APPENDIX B: Deriving the Effectiveness Index

The Effectiveness Index (EI) is derived by comparing actual scores on standardized tests with scores as predicted by a model which factors in the role community characteristics play in educational outcomes.

The Community Effects Factor (CEF) model, the statistical basis for the Effectiveness Index, was developed in a doctoral dissertation (*EducationAchievement Communities: A New Model for "Kind of Community" in Massachusetts Based on an Analysis of Community Characteristics Affecting Educational Outcomes*, May 1998, University of Massachusetts, Amherst). That work is the basis for determining school effectiveness. The model examines the relationship between selected demographic characteristics and educational outcomes. These characteristics include: average education level, average income, poverty rate, single-parent status, language spoken, and percentage of school-age population enrolled in private schools. These variables were chosen because they correlate with achievement and because the education literature identifies them as connected to academic performance.

In order to refine a better CEF model, it is first necessary to factor the impact of these demographic variables on each other. This can be done through a technique known as principal component analysis that is a statistical mechanism that reduces many variables to a few salient ones that have the most impact on an outcome. Once the factors have been identified, a regression analysis produces the equations that can be used to either build a kind-of-community model or to predict expected district performance on achievement tests. The degree to which a community's characteristics lifts or lowers test scores is reflected in a Community Effects Factor (CEF), a measure of demography.

The CEF, which is a measure of the demographic lift or drag of each community concerning educational achievement, is a good point of departure for analyzing school and school district effectiveness. The CEF identifies expected levels of performance based on community characteristics which, for better or worse, are very powerful indicators of educational achievement in Massachusetts. In this analysis, Weston is the most demographically advantaged community in the state in terms of educational outcomes (CEF = + 2.8), and Lawrence is the least advantaged (CEF = – 4.8). The CEF has a strong relationship, or correlation, to test scores. In practical application, the CEF establishes the methodology for predicting likely standardized test scores based on district demography.

Correlation is a process that identifies the interdependence of one variable with another. Correlation simply shows "the extent to which two things typically run together." [*The Economist*, 6 Dec. 1997, p. 82]. Correlation is not equivalent to causation; it can only reveal tendencies between variables, not identify causes. Correlations simply demonstrate relationships. A perfect correlation would be 1.0. For example, the correlation between inches and feet is 1.0 because it is a perfect linear fit; 12 inches always equals one foot. Correlations in real world situations involving human behavior are never 1.0.

The dissertation research found that the correlation, or the connection, between spending (Per-Pupil Expenditure or PPE) and achievement in Massachusetts was .28, which is relatively low. While spending clearly matters, merely increasing spending levels has a relatively weak impact on results. Increasingly, many people are coming to the realization that how a system spends money is more important than how much money it spends. The achievement outcome accounted for by the community effects factor (CEF) is much stronger; that relationship is .85. This is not to say the community context, the CEF, is the most important determinant of school success, but it is a significant element that must be a major consideration in any plan to improve education in disadvantaged areas.

The Effectiveness Index was generated in the following manner:

o Utilize the 1999 MCAS results as an outcome indicator for achievement in each of the state's most populous 200 communities. (NOTE: This model does not evaluate results in the smallest communities of the state which comprise about 3% of the population.)

o Utilize the CEF model to predict a score for each district. This predicted score is based solely on community characteristic as they affect educational outcomes.

o Compare the actual to the predicted score. Systems whose actual scores are significantly higher than predicted scores and whose absolute scores are at or above state average are identified as effective. Systems with positive effectiveness indexes but scores below state average are identified as noteworthy.

For more information, please contact the UMass Donahue Institute, (617) 287-7055 or contact Robert Gaudet, (617) 469-6843; rgaudet@world.std.com.

Statistical Information

Response: TOTAL MCAS 99

Summary of Fit

RSquare	0.841836
RSquare Adj	0.837019
Root Mean Square Error	20.746
Mean of Response	2095.853
Observations (or Sum Wgts)	204

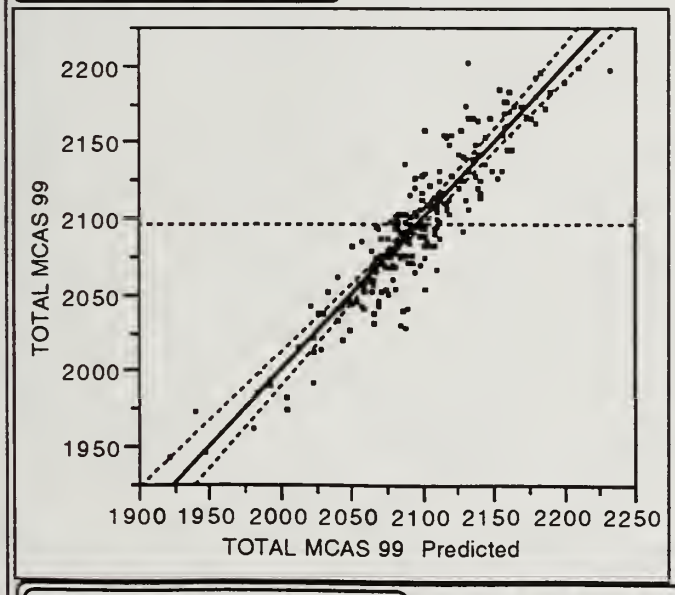
Parameter Estimates

Term	Estimate	Std Error	t Ratio	Prob>|t|	Std Beta
Intercept	2090.7843	3.684809	567.41	0.0000	0
F2Z COL	49.831473	6.385676	7.80	<.0001	0.368282
F2Z FAM$	26.815619	6.020898	4.45	<.0001	0.268135
F2Z POV	-55.84579	8.704618	-6.42	<.0001	-0.37367
F2ZPRVSCHL	-7.447792	3.505809	-2.12	0.0349	-0.0665
F2ZNONENG	-5.506262	2.511059	-2.19	0.0295	-0.09849
F2ZSPAR	6.2973197	6.14113	1.03	0.3064	0.033331

Effect Test

Source	Nparm	DF	Sum of Squares	F Ratio	Prob>F
F2Z COL	1	1	26209.710	60.8967	<.0001
F2Z FAM$	1	1	8537.322	19.8360	<.0001
F2Z POV	1	1	17715.362	41.1606	<.0001
F2ZPRVSCHL	1	1	1942.438	4.5131	0.0349
F2ZNONENG	1	1	2069.515	4.8084	0.0295
F2ZSPAR	1	1	452.568	1.0515	0.3064

Whole-Model Test



Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	6	451289.51	75214.9	174.7573
Error	197	84788.08	430.4	Prob>F
C Total	203	536077.59		<.0001